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Gmacs

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# Generalized Modeling for Alaskan Crab Stocks

Crab Modeling Workshop January 2014



Dr Athol Whitten  
School of Aquatic and Fishery Sciences  
The University of Washington, Seattle WA

# Acknowledgements

**Gmacs is a collaborative project between the  
University of Washington, and NOAA Fisheries;  
Collaborators: Andre Punt, Jim Ianelli,  
and with advice from  
Mark Maunder (CAPAM) and Steve Martell (IPHC)**

**Partial funding provided by the  
Bering Sea Fisheries Research Foundation**



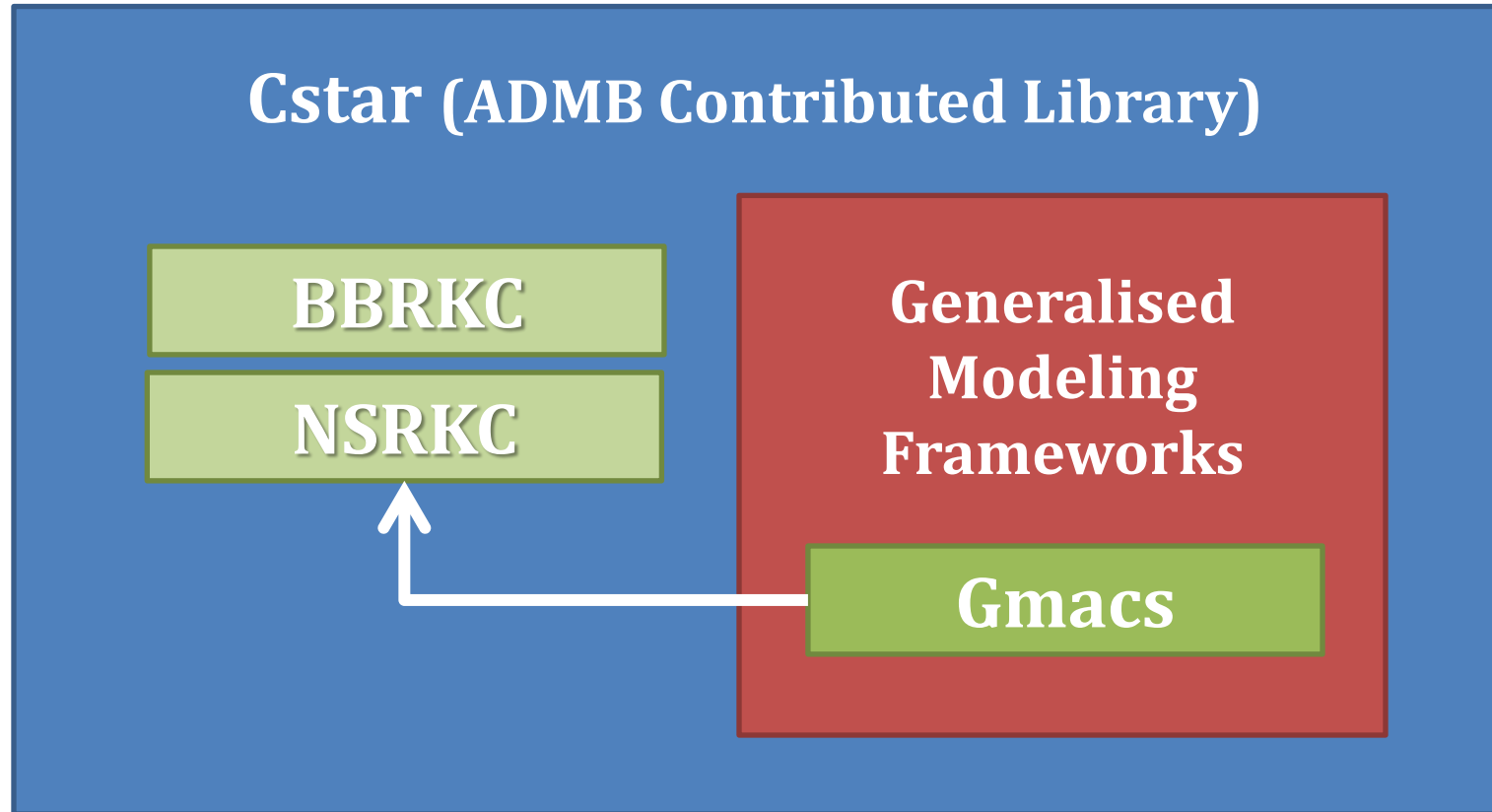
**Dr Athol Whitten  
School of Aquatic and Fishery Science  
The University of Washington**

# Gmacs: Generalized Modeling for Alaskan Crab Stocks



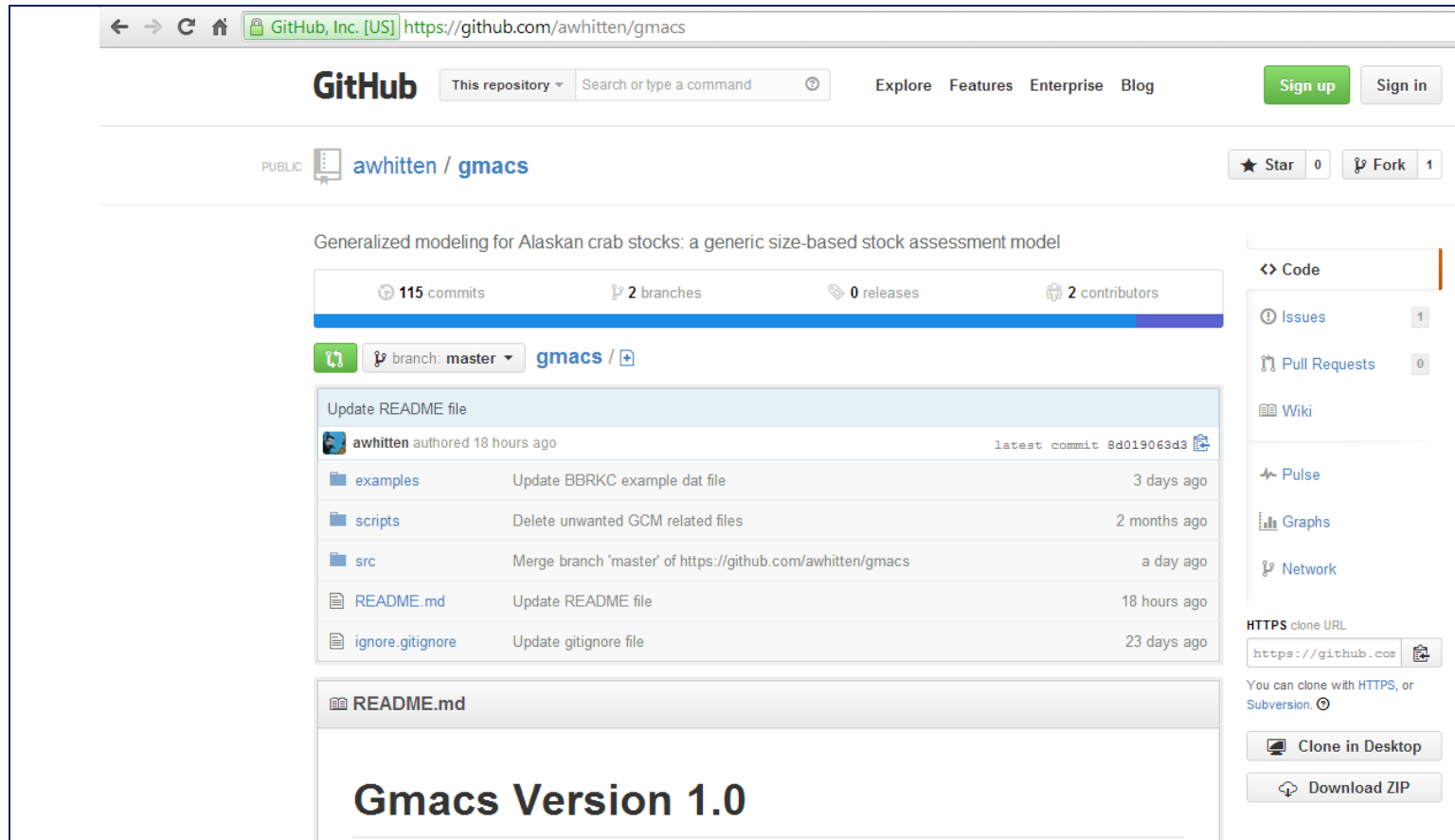
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# Gmacs will be implemented using Cstar



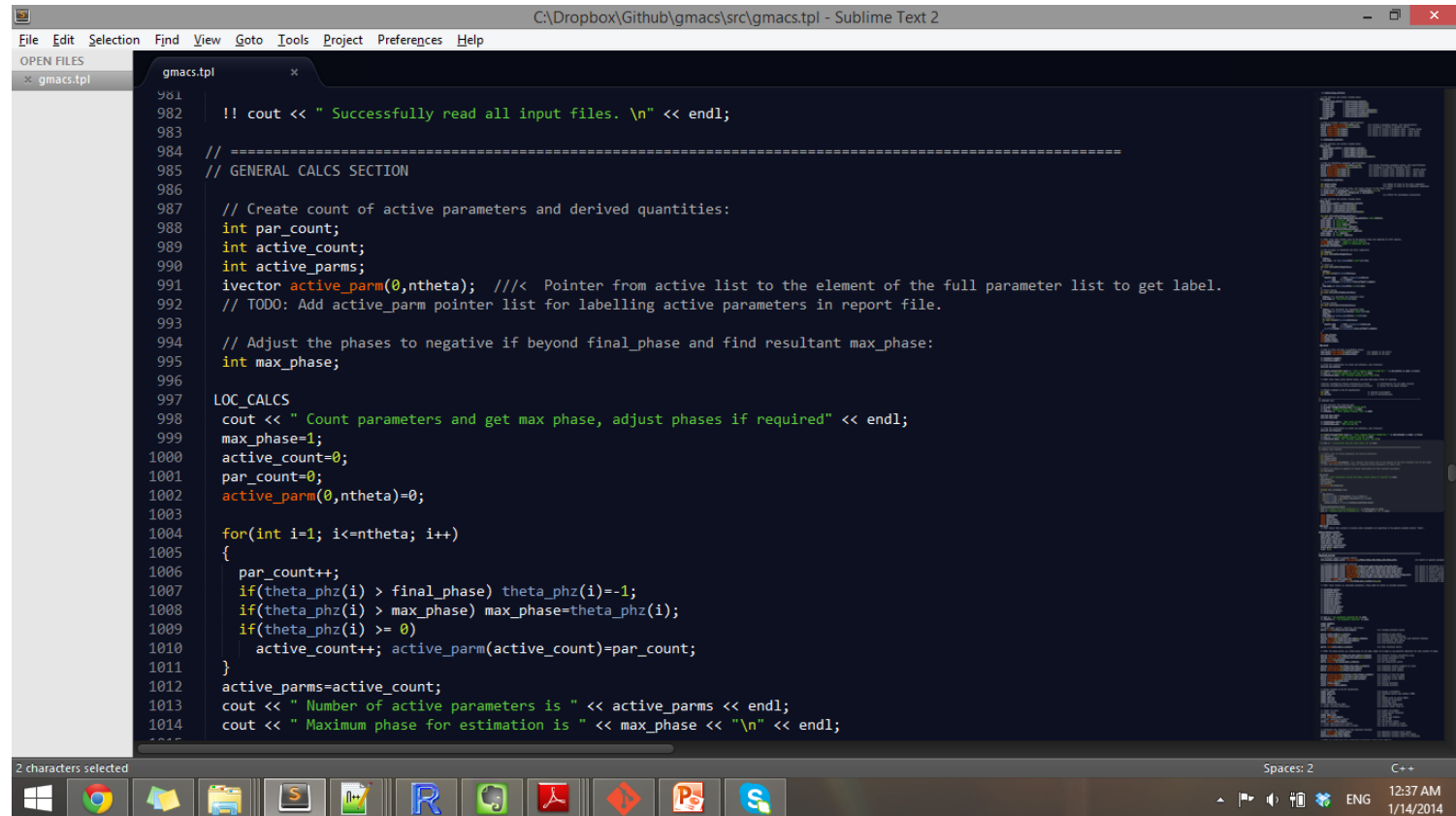
See: <https://github.com/awhitten/gmacs>

# Using Github to store, share, and collaborate



**Collaboration possible onsite or by using **Git**:**  
**Can download entire repositories to local machines**

# Code is publically available



```
981
982  !! cout << " Successfully read all input files. \n" << endl;
983
984  // =====
985  // GENERAL CALCS SECTION
986
987  // Create count of active parameters and derived quantities:
988  int par_count;
989  int active_count;
990  int active_parms;
991  ivector active_parm(0,ntheta); ///< Pointer from active list to the element of the full parameter list to get label.
992  // TODO: Add active_parm pointer list for labelling active parameters in report file.
993
994  // Adjust the phases to negative if beyond final_phase and find resultant max_phase:
995  int max_phase;
996
997  LOC_CALCS
998  cout << " Count parameters and get max phase, adjust phases if required" << endl;
999  max_phase=1;
1000  active_count=0;
1001  par_count=0;
1002  active_parm(0,ntheta)=0;
1003
1004  for(int i=1; i<=ntheta; i++)
1005  {
1006    par_count++;
1007    if(theta_phz(i) > final_phase) theta_phz(i)=-1;
1008    if(theta_phz(i) > max_phase) max_phase=theta_phz(i);
1009    if(theta_phz(i) >= 0)
1010      active_count++; active_parm(active_count)=par_count;
1011  }
1012  active_parms=active_count;
1013  cout << " Number of active parameters is " << active_parms << endl;
1014  cout << " Maximum phase for estimation is " << max_phase << "\n" << endl;
```

And has been written with flexibility and usability in mind...

# General Population Dynamics

- Size-structured, fully integrated assessment
- Numbers at time and length
- Also accounts for numbers at sex, maturity, and shell condition. Crab can be:
  - Male, female, unknown
  - New shell / old shell (1,2,...) / unknown
  - Mature / immature / unknown
- Natural Mortality can be time-varying and sex-specific

# General Population Dynamics

- Size-structured, fully integrated assessment
- Growth can be fixed or estimated
  - Gamma distributed growth increments
  - Can be sex specific and time-varying
- Molting probability as logistic function of length
- Maturation as logistic function of length
- Stock recruitment estimated as yearly-deviations



# Fishery Specifications

- Landings recorded from directed fisheries
- Discards from landed *and other fisheries* (bycatch)
- Fishing mortality estimated or directly specified
  - Handling mortality included in calculations
  - High-grading included in calculations
- Retention specified as piecewise or logistic function
- Selectivity can be defined for any fleet or survey
  - Can be sex-specific and time-varying

# Data Types & Model Fit

- **Model makes use of:**
  - **Catch and discard data**
  - **Fishery or survey indices of abundance**
  - **Effort data**
  - **Length composition data**
  - **Weight-at-length, and fecundity specified**
  - *Later: Tag-recapture data*
- **Model fits to catch, discard, indices, and LF data**
- **Different weights can be applied to each data set**
- **Weights on priors, and penalties can be specified**

# Model Outputs

- **Size of the reproductive component of population**
  - Reported in terms of mature male biomass
  - Specified for particular fraction of year
- **Fits to catch, survey, and length frequency data**
- **Estimates of selectivity etc.**
- *Later: Projected stock abundance (forecast section)*

# Thanks for listening...



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